CITI-SENSE

Development of sensor-based Citizens' Observatory Community for improving quality of life in cities

Newsletter Nº 11 **March 2016**

Dear reader,

In the previous newsletter you got an impression of the diversity of tools and products that we have prepared to be used within our Citizens' Observatories. Seven tools shall facilitate the involvement of citizens in assessment of air and environmental quality in order to participate in environmental governance: [1] Personal air monitoring toolkit (LEO), [2] CityAir smartphone app, [3] Online air quality perception questionnaire, [4] Environmental monitoring toolkit for public spaces, [5] Data visualization web page, [6] Data download web page, and [7] CITI-SENSE Citizens' Observatories Web Portal with access to the Citizens' Observatories Toolbox (COT).


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All information about these products is collected in a little brochure that is available for download under Information Material at www.citi-sense.eu.

This issue will present one of our most important tools, the CITI-SENSE CO web portal. It provides free access to the Citizens' Observatories Toolbox (COT), including a collection of tools and information about how to get hold of them. In addition, we focus on a technique that has been developed in CITI-SENSE to exploit information from citizens' observations and crowd sourcing for mapping of urban air quality: data fusion.

Happy reading!

Alena Bartonova, NILU

The CITI-SENSE Citizens' Observatories Web portal – A gateway to the Citizens' Observatories Toolbox (COT) is now open (Hai-Ying Liu, NILU)

The CITI-SENSE Citizens' Observatories Web Portal is now open at http://co.citi-sense.eu/. Welcome!

The portal has been designed as access point for citizens to the tools and products developed by CITI-SENSE, including data and information which might be useful for them. On the other side, the portal is also providing a forum for all users to upload their own observations, share them and discuss.

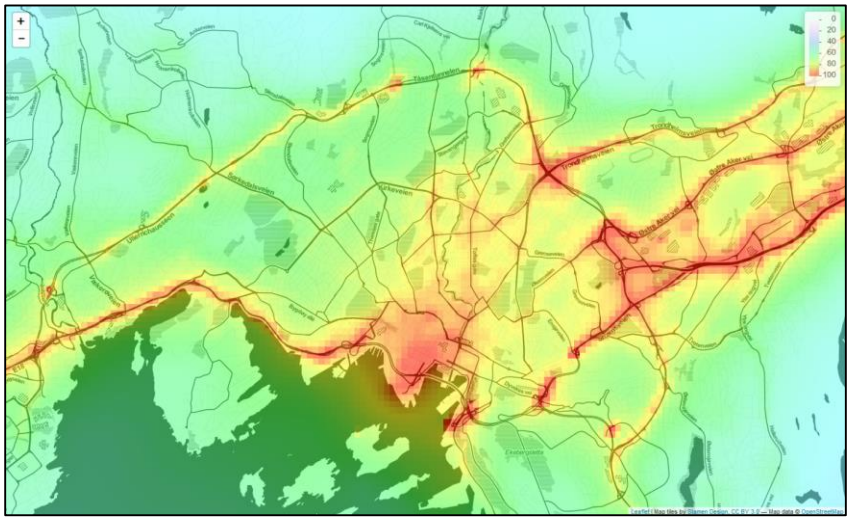
In the last issue of our newsletter, we provided a short overview of the products and technologies that have been developed in CITI-SENSE during the last months. This includes mobile apps, widgets, web pages, as well as sensor based tools and questionnaires. The web portal contains information about how to acquire, install and use our tools and provides direct access to a number of them. Here, you can also access collected data from our various Citizens' Observatories. For the technically minded, you can get specifications about the sensing devices, and detailed information about how to use our data for your own applications. And of course you can learn more about the project that brought this to you, CITI-SENSE, and the various Citizens' Observatories that have been implemented within CITI-SENSE, i.e., Citizens' Observatories on outdoor air quality in eight cities, on indoor air quality in 12 schools, and on environmental quality in four public spaces. Additional features are links to various Citizens' Observatories social media platforms as well as the synergy and integration with GEOSS.

The COT is supposed to support anyone in designing, setting up and carrying out their own Citizens' Observatory. Drop by and have a look if you find anything that might help you. And don't hesitate to send us your feedback – after all, this is a service provided for YOU.

Mapping of urban air quality (Philipp Schneider, NILU)

Low-cost microsensors such as those that are deployed within the framework of the CITI-SENSE project in various locations in Europe have significant potential for enabling the generation of up-to-date maps of urban air quality. The data provided by such sensor networks can offer unprecedented spatial detail and thus exhibit a significant potential for allowing to create observation-based high-resolution maps of air quality in the urban environment. However, most datasets of observations made within a citizen science or crowdsourcing framework tend to have highly variable characteristics in terms of quantity, accuracy, measured parameters, representativeness, and many more. It is therefore currently unknown how to best exploit this information for mapping purposes.

The CITI-SENSE project has deployed a network of AQMesh pods in various locations throughout Europe. The devices are being used to acquire hourly observations of various air pollutants including NO_2, PM_{10}, and $PM_{2.5}$ as well as meteorological parameters. While such observations provide interesting estimates of air quality at the locations where the instruments are located, many applications require air quality information in areas where no monitoring instruments are available. In order to offer such personalized services, e.g. providing the user with air quality estimates exactly at their home or estimating the exposure to air pollutants on their bicycle commute to work, it is necessary to develop spatially continuous maps of concentrations of the various pollutants.



An example of a high-resolution urban air quality map for Oslo, here showing the concentration of nitrogen dioxide (in units of µg/m3) on a day in January 2016. The map combines the information from 24 AQMesh sensors deployed throughout the city and additional information coing from the EPISODE urban air pollution dispersion model.

This task is performed within CITI-SENSE using data fusion techniques. At each location, hourly average data on NO_2, PM_{10}, and $PM_{2.5}$ provided by the AQMesh units are combined with a detailed map of long-term average air quality, which is derived from either an urban-scale dispersion model (in the case of Oslo) or statistical methods such as land-use regression (in the case of all other CITI-SENSE study sites). This combination, or data fusion, is accomplished using geostatistical techniques.

The result of the data fusion process are hourly updated maps of the major air pollutants for each CITI-SENSE location. The figure shows an example map of NO_2 for Oslo. In practice, these maps are then converted to an air pollution indicator (APIN) with 5 classes in order to enable easier interpretation. Using maps such as this as a base, various personalized services can be derived. For example, a user can estimate the personal exposure to air pollutants along a certain path through the city, or perform automated route planning to find the least polluted route to walk or bike from Point A to Point B, which might differ from the shortest or fastest route.

Upcoming events

Activity/event	Where?	When?
EGU 2016 http://www.egu2016.eu/	Vienna, Austria	17-22.04.2016
ESA Living Planet Symposium 2016 http://lps16.esa.int/	Prague, Czech Republic	09-13.05.2016
ECSA http://www.ecsa2016.eu/index.html	Berlin, Germany	19-21.05.2016
Major Cities 2016 http://www.majorcities.eu/conferences/2016-florence/	Florence, Italy	30.05.- 01.06.2016
Green Week 2016 http://www.greenweek2016.eu/index.html#	Brussels, Belgium	30.05.- 03.06.2016
IOT Week http://iot-week.eu/	Belgrade, Serbia	31.05.- 02.06.2016
10th GEO European Projects Workshop 2016 https://ec.europa.eu/easme/en/geo-european-projects-workshop-2016	Berlin, Germany	31.05.- 02.06.2016
Conwater 2016 http://www.conwater2016.eu/index.php/en/	Venice, Italy	07-10.06.2016
ICUR 2016 http://www.ceru-europa.pt/icur2016/index.htm	Lisbon, Portugal	30.06.- 02.07.2016
Indoor Air 2016 http://www.indoorair2016.org/	Ghent, Belgium	03-08.07.2016
ISEE 2016 http://www.isee2016roma.org/	Rome, Italy	01-04.09.2016
INCHES 2016 http://inchesnetwork.net/conference-2016/	Barcelona, Spain	14-16.09.2016

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Citizens' Observatories website: http://www.citizen-obs.eu/

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